Charter Street Heating Plant
Request for Proposal
Preview

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Topics

- Charter Street Heating Plant (CSHP) Upgrade
- Proposed biomass specification
- Proposed RFP overview

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Charter Street Heating Plant Upgrade

Existing Plant

Conceptual Design

Driving Demand for Biomass

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Charter Street Heating Plant Upgrade

- Provides district heating and cooling
- Services UW Madison campus
- Cogenerate electricity
- Serves > 20MM sq ft on campus

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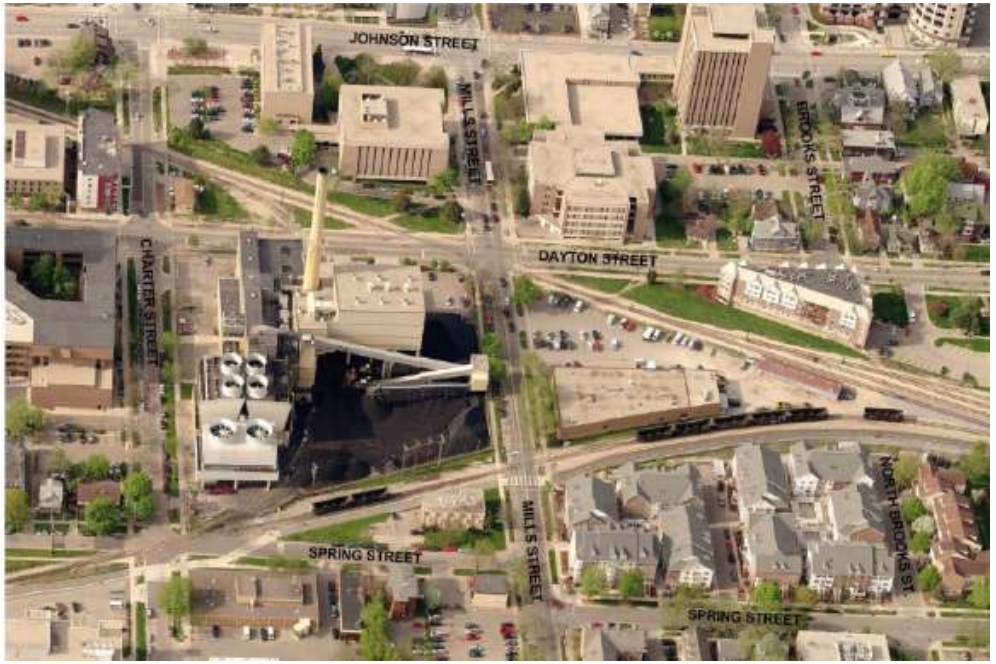
Current Charter Street Heating Plant

Current Capacity:

- 800,000 lbs/hr steam
- 26,000 tons chilled water
- 9 MW electric production



- Historically burned 130,000+ tons of coal per year
- 1960 vintage technology
- Air emissions - candidate under Prevent of Significant Detoriation program

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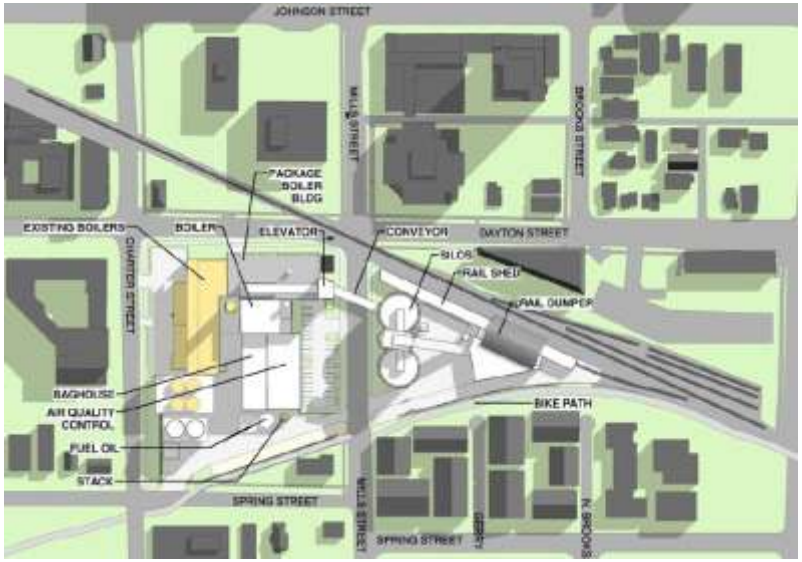
Tomorrow's Plant

Heating Plant

- 3 gas boilers & 1 biomass boiler
- Gas boilers 2011/2012
- Fully functional by 2Q 2013
- New biomass boiler is designed to burn 100% biomass with natural gas back-up
- New capacity: 1.1 million lb/hr steam
- 29 MW electricity



Biomass Boiler

- Biomass Boiler
  - 350,00 lbs/hr steam
  - Vibrating grate
  - Fed from 2 silos on site
- Biomass Sources
  - Designed to be flexible
  - Assist in business development for bioenergy

Biomass Benefits

- Economic benefit – create market for homegrown fuel
- Create Fuel Flexibility for the Plant
- Environmental benefit – No Coal

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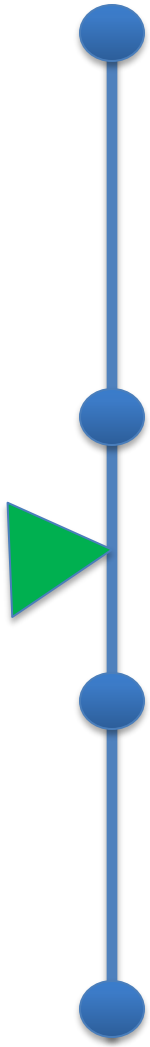
Developing CSHP Biomass Supply Chain

- Biomass available
  - Biomass inventory
  - Procurement request
  - Quality testing
- Obtain appropriate permits
  - Zoning / EIS
  - Emission permitting
- Communicate constraints
  - Biomass specifications
  - Logistics
  - Contract terms
- Identify supply partners



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CSHP Biomass Fuel Specifications

CSHP Biomass Fuel Specifications

- Overview – (What's Required and Why):
  - Heat Content
  - Moisture
  - Density
  - Ash
  - Fuel Particle Size
  - Sulfur Level
  - Nitrogen Level
  - Chloride Level
  - Mercury Level

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Biomass – Materials vs. Fuels

Biomass Materials

- Raw Biomass Materials are NOT Fuel
- CSHP will NOT process raw biomass materials into Fuel

CSHP Biomass Fuels

- Biomass materials Must be Processed & Refined into Fuel
- Biomass Fuels Must Meet CSHP Fuel Specifications

Biomass Fuel Requirements

- Biomass Fuels MUST meet plant **Operating** needs
- Biomass Fuels Must meet plant **Regulatory** needs

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CSHP Biomass Fuel Specifications

- Specifications Based on:
  - **Operational** Requirements

    and

  - **Regulatory** Requirements

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CSHP Biomass Fuel Specifications
Operational Related

- Based on:
  - Fuel Delivery
  - Fuel Unloading
  - Fuel Storage
  - Fuel Handling
  - Boiler Fuel Feed
  - Boiler Fuel Combustion
- Include:
  - Heat Content
  - Moisture
  - Density
  - Ash
  - Fuel Size

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Operational Related Specifications **

Fuel Type	Chipped Fuel	Pellet Fuel
Heat Content (Btu/lb)	5,000 – 6,500	7,500 – 8,500
Moisture (%)	40% - 20%	15% - <5%
Density (lbs/cu ft)	20 - 16	34 - 42
Ash (%)	<1% - 2%	1% - 3%
Fuel Size* (Inches) (*Note boiler and fuel handling equipment require well graded chip fuel)	< 3 “ = 100% < 2 “ = 80-100% < 1 “ = 60-80% < 1/2 “ = 40-60% < 1/4 “ = 20-40% < 1/8 “ = 10-30% < 1/16 “ = 0-20%	3/8” x 3/8” x 1” up to 3/4” x 3/4” x 3” and Less than 5% fines

** Fuel specifications will fall within these ranges.
* Allowable ranges will be further refined with Boiler Manufacturer prior to RFP.

Operational Related Specifications

- Fuel Heat Content & Density are Critical to:
  - Rail Transportation
    - Impacts number of delivered rail cars required per day
    - Impacts fuel costs in the form of rail delivery charges
    - Impacts capital costs in the number of rail cars required
  - On-Site Fuel Handling
    - Impacts quantity of fuel to be handled
    - Impacts on-site handling costs
    - Impacts days of on-site fuel storage

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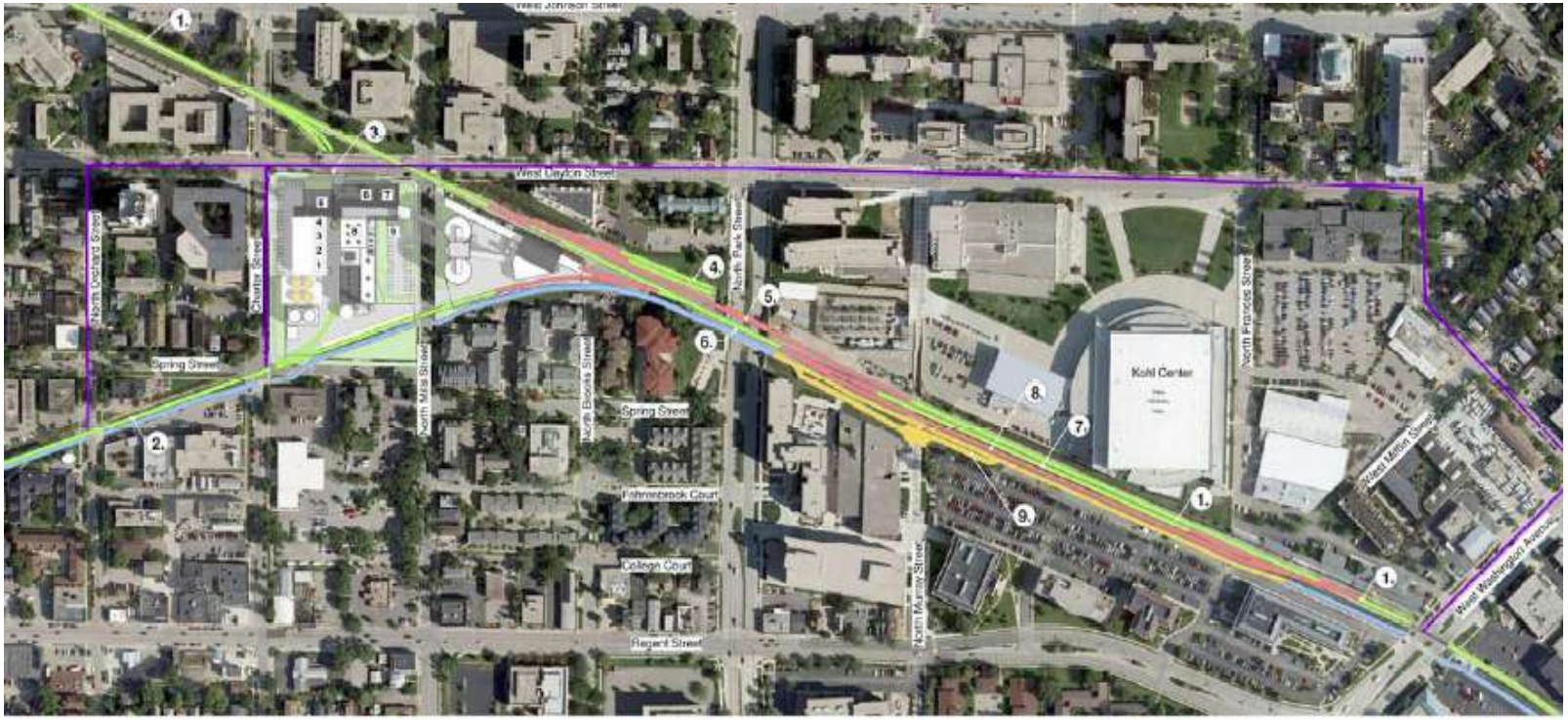
Upgrades to Rail System for Biomass Fuel Delivery



Proposed Bike Path Detour Route

1. Existing Main rail of Wisconsin & Southern Railroad.
2. Existing rail spur and switch (to remain operational).
3. Exisiting rail spur/grade crossing (to be abandoned).
4. Existing rail spur to remain as is.
5. Widen bridge over Park Street (for new main line).
6. Existing railroad and bike path bridge to remain (as is).
7. Railroad siding (16 full cars, 72' long).
8. Railroad siding (16 empty cars, 72' long).
9. Relocated / Reconstructed bike path.

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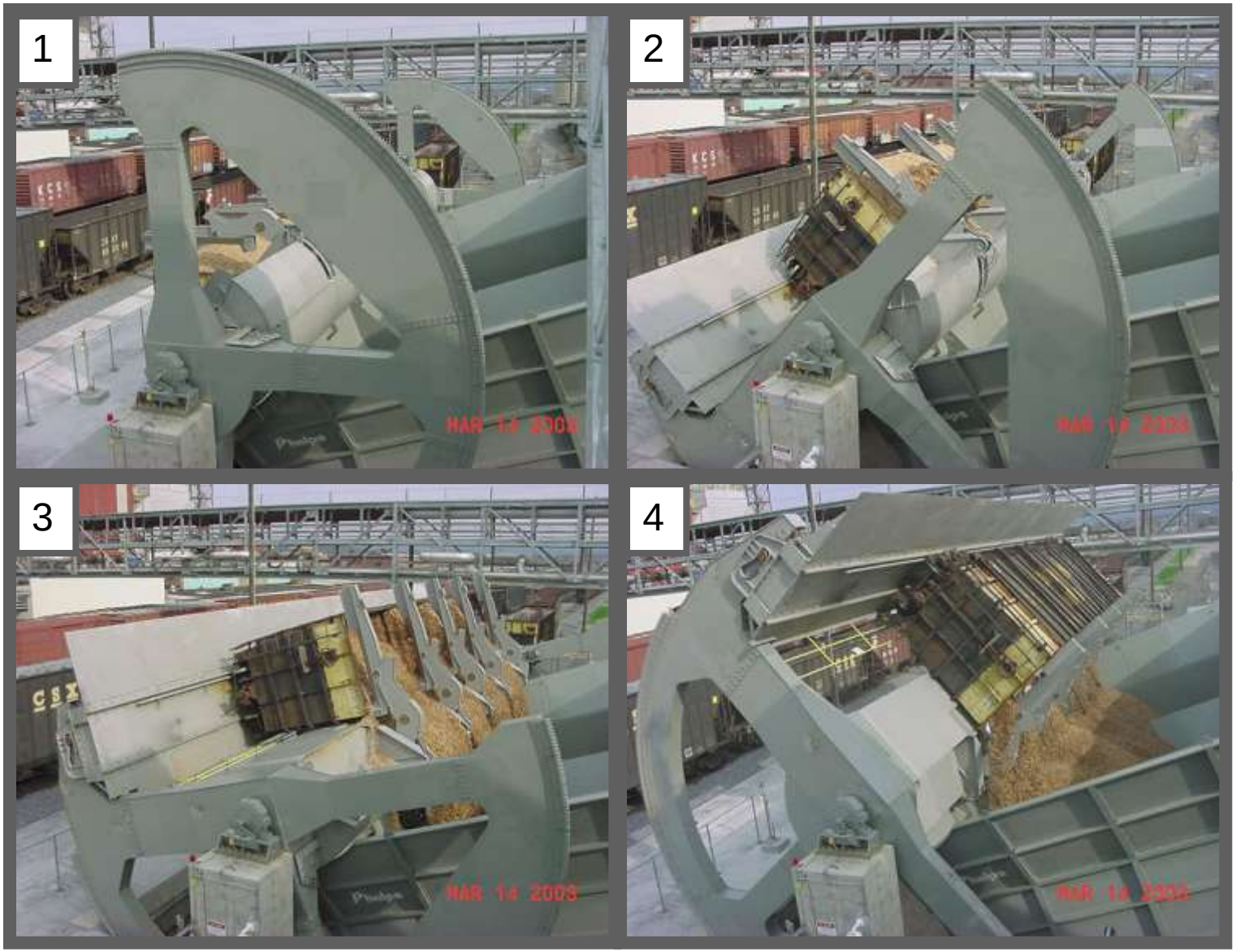
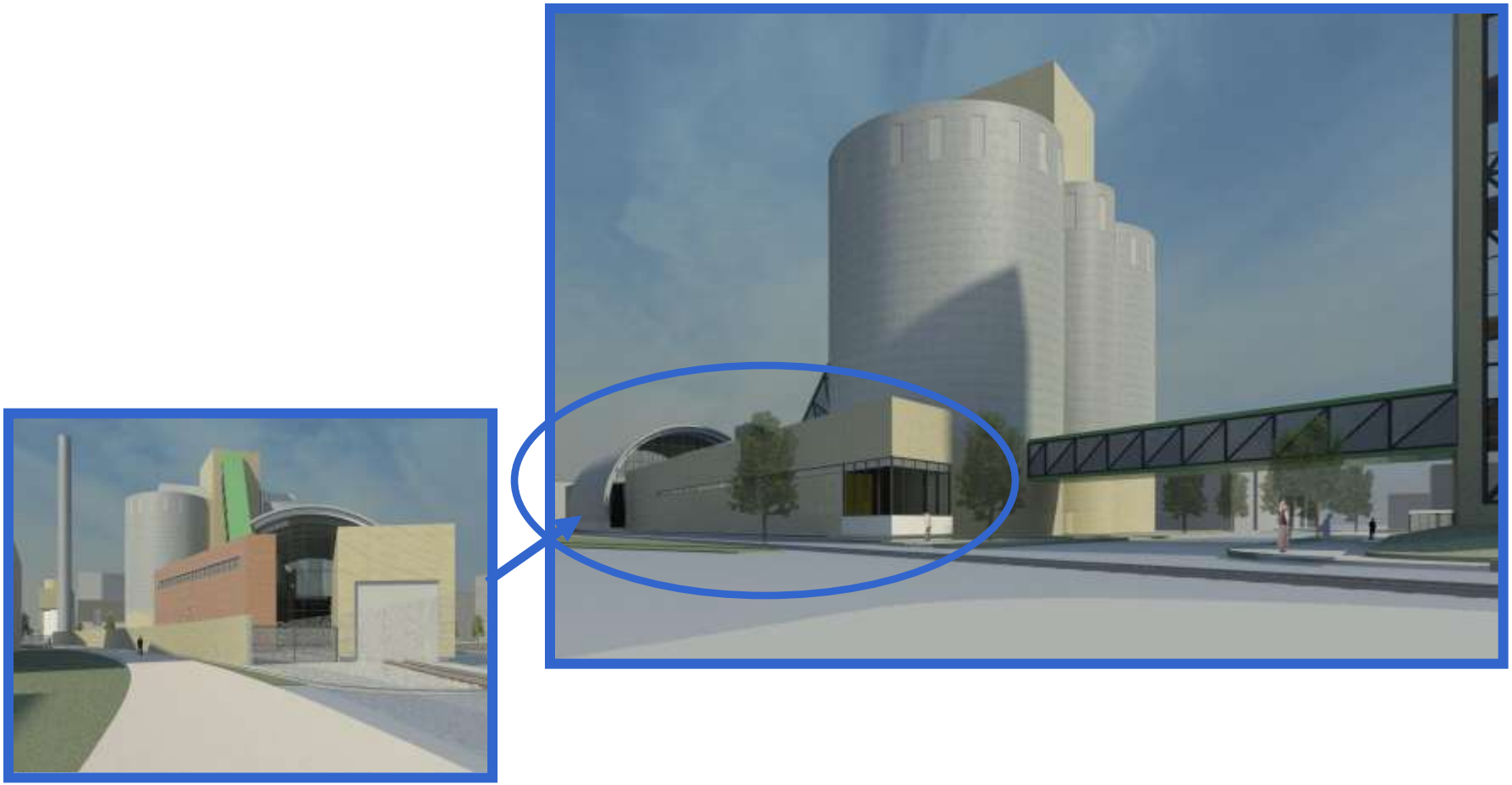
Rail Car Unloader Operation



Rail Car Unloader Building



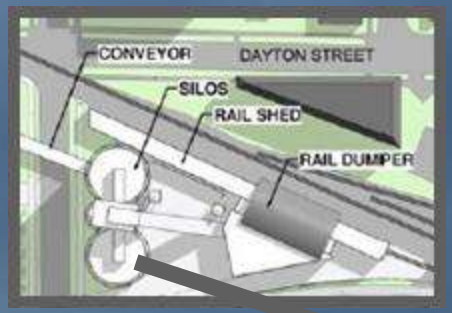
Operational Related Specifications

Impacts on **Rail Cars** ** **Required per Day**				
Fuel Type	Chipped	Chipped	Pellet	Pellet
Heat Content (Btu/lb)	5,000	6,500	7,500	8,500
Density (lbs / cu ft)	18	18	34	38
Unit Load at 100% Output	28 (cars/day)	21 (cars/day)	10 (cars/day)	8 (cars/day)
Unit Load at 80% Output	22 (cars/day)	17 (cars/day)	8 (cars/day)	7 (cars/day)
Unit Load at 60% Output	17 (cars/day)	12 (cars/day)	6 (cars/day)	5 (cars/day)

** Rail Cars assumed to be 7,000 cu ft in size

Biomass Fuel Silos

October 29, 2010



Operational Related Specifications

Impact on Fuel Silos Storage in **Days of Operation per Silo**				
Fuel Type	Chipped	Chipped	Pellet	Pellet
Heat Content (Btu/lb)	5,000	6,500	7,500	8,500
Density (lbs / cu ft)	18	18	34	38
Silo Level at 100% Full	1.8 (days)	2.2 (days)	5.0 (days)	6.0 (days)
Silo Level at 80% Full	1.5 (days)	1.8 (days)	4.0 (days)	4.8 (days)
Silo Level at 60% Full	1.2 (days)	1.4 (days)	3.0 (days)	3.6 (days)

NOTE: For long term planning – the storage days of operation shown are for one biomass plant. In the future when a second biomass plant is added the days storage will be half the values shown.

Operational Related Specifications

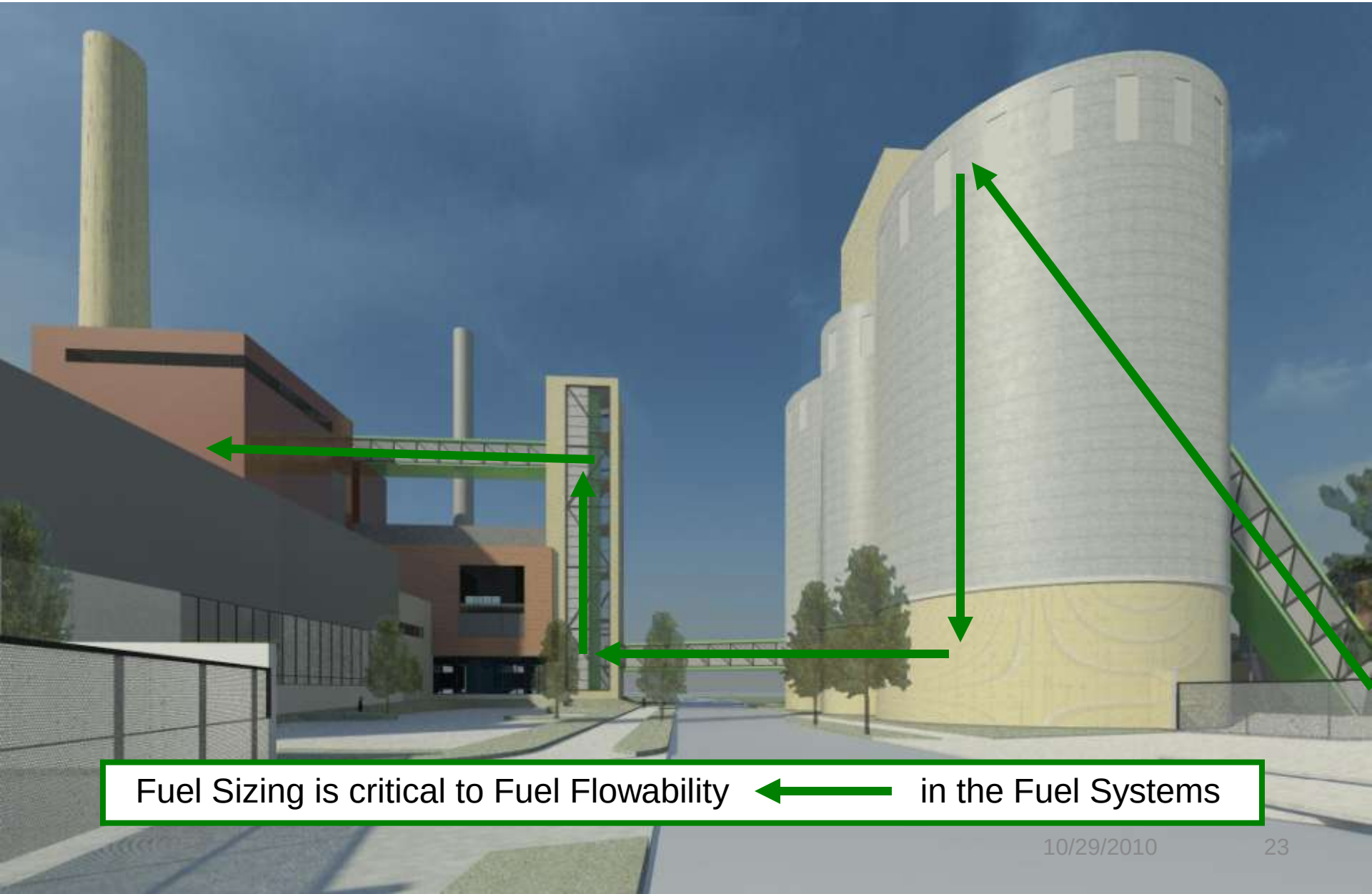
- Biomass Fuel Sizing is Critical to:
  - Fuel Flowability
    - Flow Through Conveyors
    - Flow Through Silos
    - Flow Through Reclaimers
    - Flow Into Boiler
  - Fuel Combustion:
    - On Boiler Grate
    - In Boiler Furnace

Chipped Fuel*	Pellet Fuel*
< 3 “ = 100% < 2 “ = 80-100% < 1 “ = 60-80% < 1/2 “ = 40-60% < 1/4 “ = 20-40% < 1/8 “ = 10-30% < 1/16 “ = 0-20%	3/8” x 3/8” x 1” up to 3/4” x 3/4” x 3” and Fines <5%

* Allowable ranges will be further refined with Boiler Manufacturer prior to RFP.

Biomass Fuel Silos

October 29, 2010



Fuel Sizing is critical to Fuel Flowability ← in the Fuel Systems

Regulatory Related Fuel Specifications

- Air Quality Requirements Based on:

  - Air Permit
    - Being Finalized in State Regulatory Process
    - Final* Air Permit and Requirements expected in December 2010
  - MACT* Requirements
    - Being Finalized in Federal Regulatory Process
    - New Federal Regulations* and Limits expected in January 2011

* May impact projections for Chlorine and Mercury

Regulatory Related Specifications

Maximum Plant Emissions per **Air Permit**

- Regulations now being finalized:
  - With new MACT regulations Chlorine and Mercury levels have become extremely tight and complex.
  - Finalization of the air permit in December and MACT in January will help us better understand these new limits and the impacts on chlorine and mercury in our biomass fuel specifications.
  - Currently we are estimating a range of specification limits based on the draft permit and regulations.

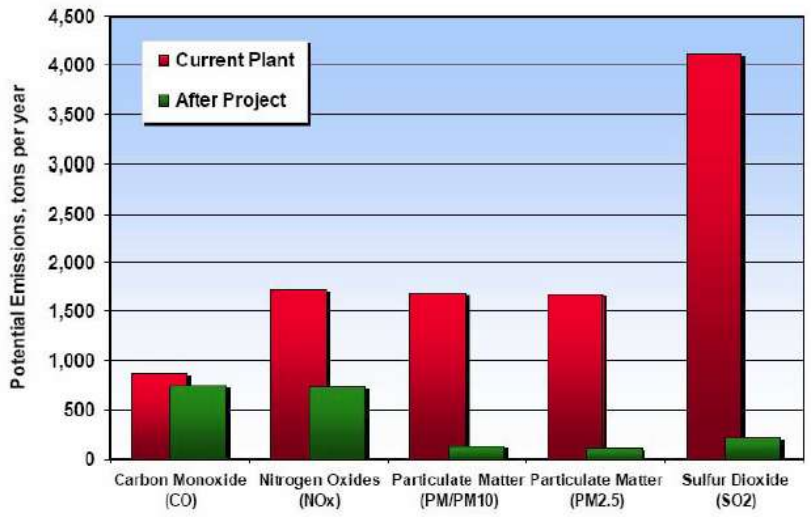
**** NOTE: Fuel specification chemistry limits will be further refined and finalized with the final approved air permit and work with the Boiler & AQCS Systems Manufacturer prior to the RFP.**

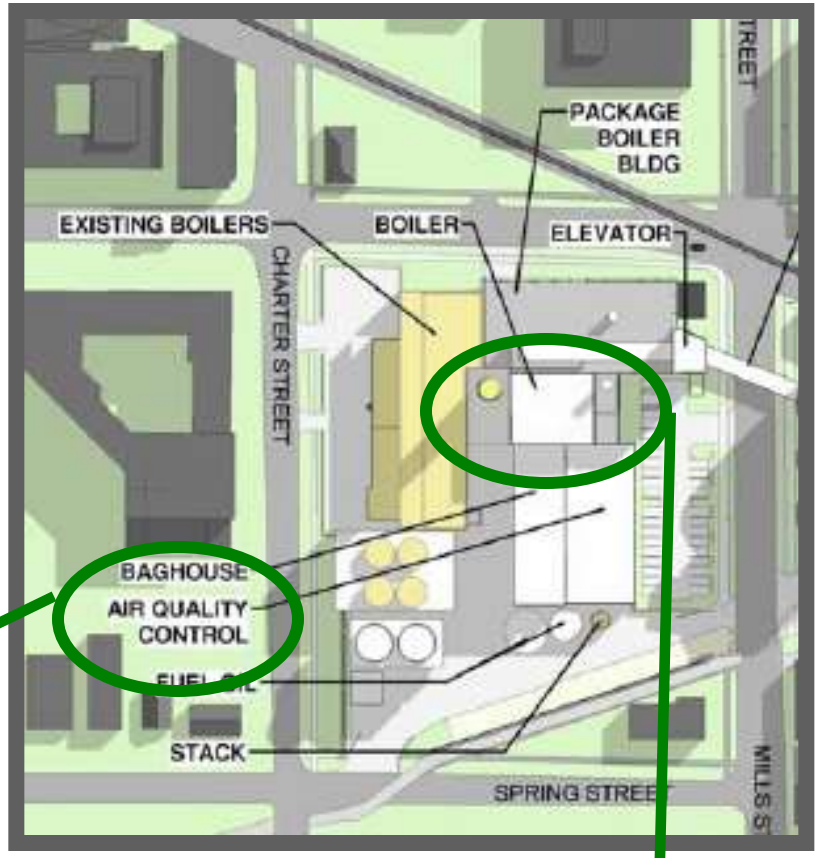
Regulatory Related Fuel Specifications

- Air Permit Emissions Limits:
  - Sulfur Dioxide **(SO2) @** 0.05 **lbs/mmBtu**
  - Nitric Oxide **(Nox) @** 0.068 **lbs/mmBtu**
  - Hydrogen Chloride* **(HCL) @** 0.004 **lbs/mmBtu**
  - Mercury* **(Hg) @** 0.0000008 **lbs/mmBtu (0.8 x 10^{-6})**

* Emission Limits related to new MACT (Maximum Available Control Technology) Regulations.

Future Air Quality Control Systems





1) New advanced air quality control equipment to meet strict new air quality regulations.

2) Tighter fuel specifications also required to meet strict new air quality regulations.

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Regulatory Related Specifications

Estimated Impact on Fuel Quality with new Air Emission Limits				
Fuel Type	Chipped		Pellet	
Heat Content (Btu/lb)	5,000	6,500	7,500	8,500
Sulfur ** (%)	< 0.08%	< 0.11%	< 0.13%	< 0.14%
Nitrogen ** (%)	< 0.15%	< 0.19%	< 0.22%	< 0.25%
Chloride ** (%) (ppm)	< 0.013% < 130 ppm	< 0.017% < 170 ppm	< 0.019% < 190 ppm	< 0.022% < 220 ppm
Mercury ** (ppm)	< 0.027 ppm	< 0.035 ppm	< 0.040 ppm	< 0.045 ppm

**** NOTE: Fuel specification chemistry limits will be further refined and finalized with the final approved air permit and work with the Boiler & AQCS Systems Manufacturer prior to the RFP.**

CSHP Biomass
Proposed Request for Proposal

RFP Design

Requesting proposals for solid biomass fuel supply service

Included Sections

1. Business information about the firm
2. Information about the biomass fuel
3. Quality control of the Biomass and the ability to meet the Biomass Specification
4. Information on fuel delivery plans and ability to maintain supply at the plant
5. Fuel pricing information

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RFP Design

Included Sections:

6. The ability to meet the Sample Contract Terms
7. Plans to address sustainability of harvesting, storage and transportation
8. Potential workforce development provided by the business
9. Potential ecological services provided by the business
10. Standard State supplier forms

Encouraged themes for the RFP

- Aggregators that are pulling biomass from multiple producers.
- Executions that incorporate bioenergy crops over time.
- Detailed plans to insure high quality consistent supply.
- Plans to continually improve energy density and cost effectiveness.
- Plans that assist the plant in managing the fuel supply.

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RFP Timing

- After Air permit is issued – Jan 2011
- 90 days to allow proposals to be pulled together
- 30 days for review/interviews – State commissioned review panel

Next steps for interested suppliers

- Provide feedback on draft RFP
- Understand the proposed biomass specification and how it relates to your fuel
- Start preparing your proposal

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Presentation available at

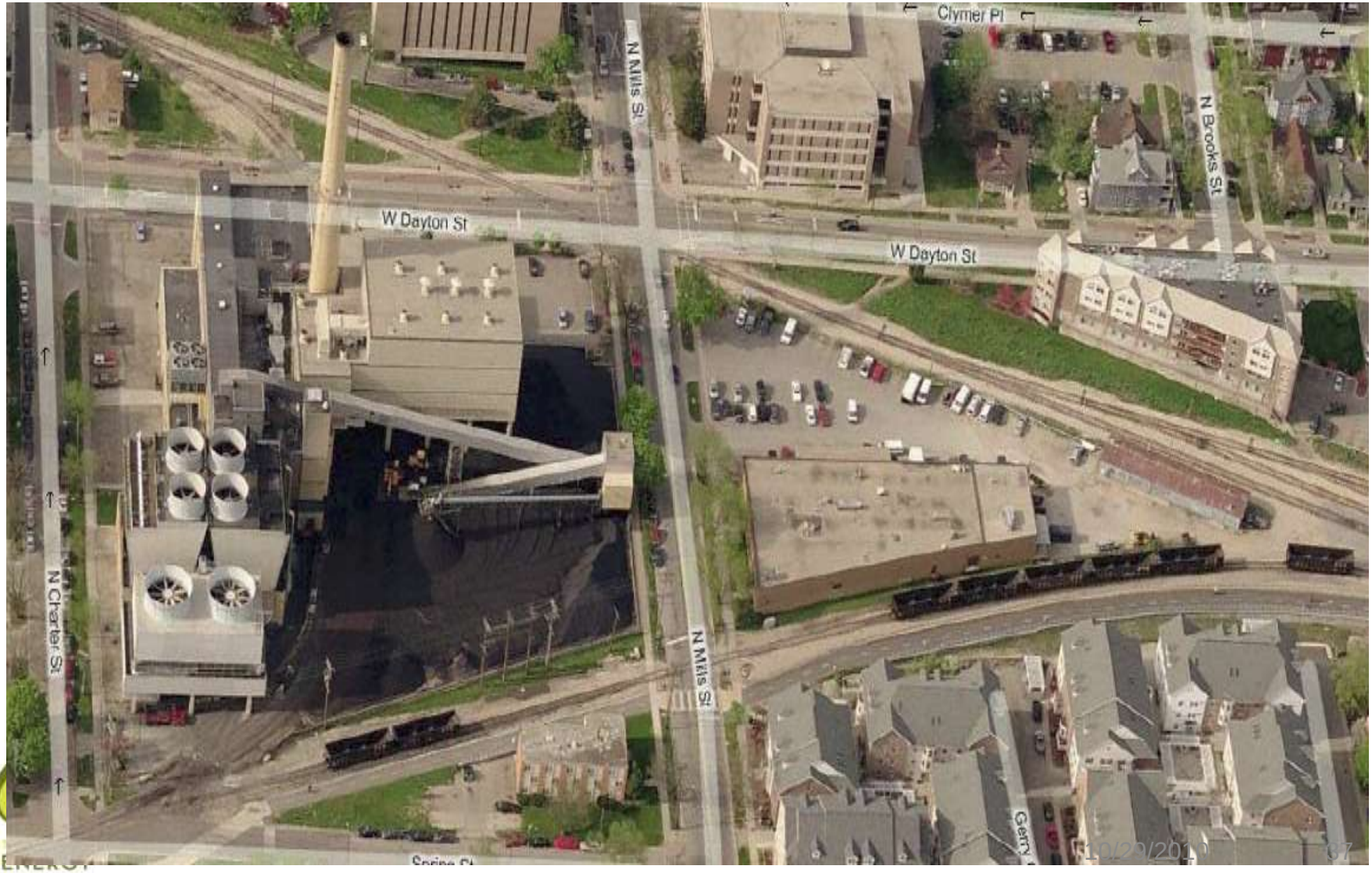
http://www.wbi.wisc.edu/charter-street-biomass-heating-plant/

Contact:

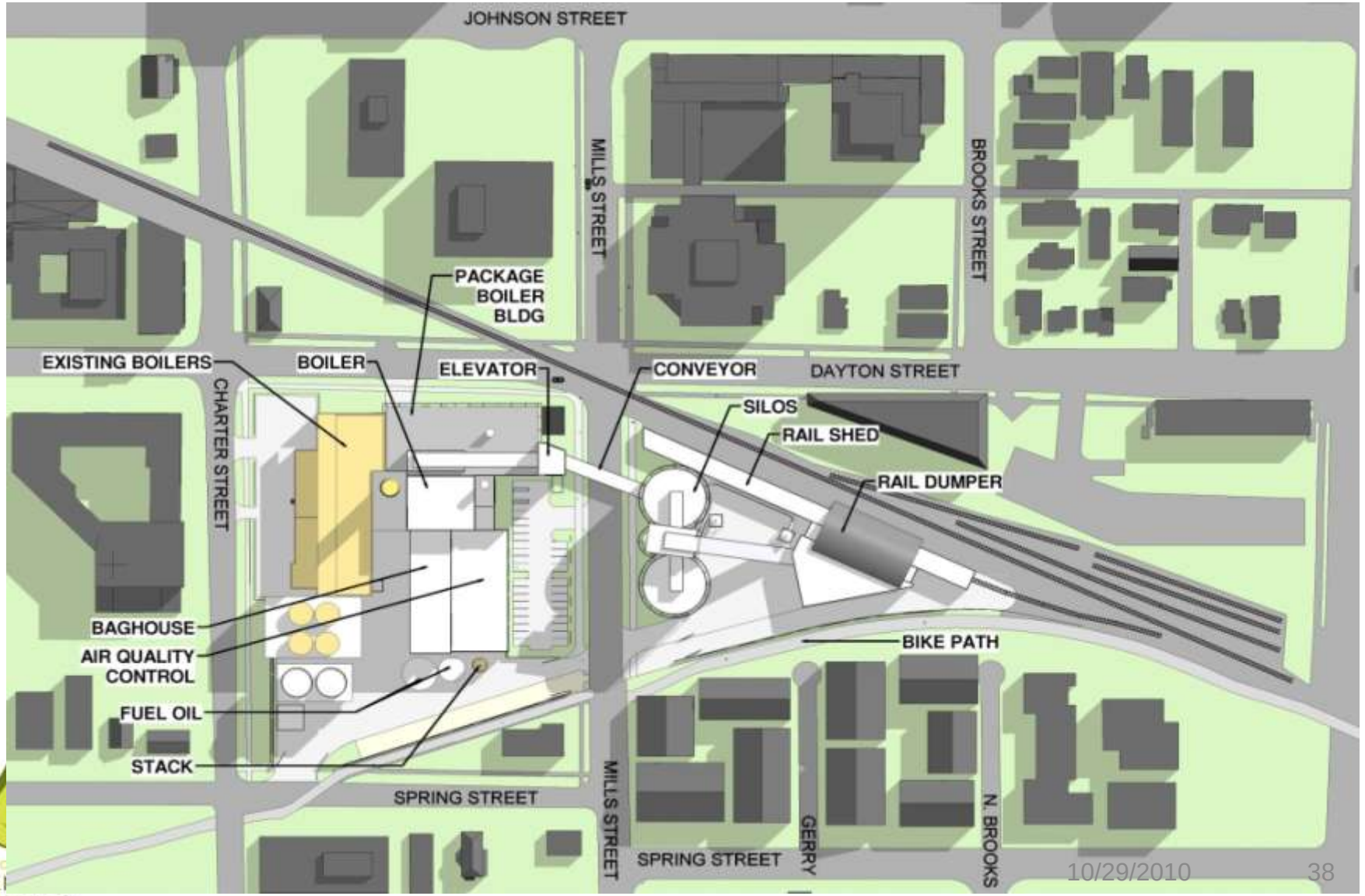
trunge@wbi.wisc.edu

Additional slides

Current Coal-Fuel Based Site



Future Biomass-Fuel Based Site



Future Biomass Plant & Fuel Systems

Future Biomass Plant & Fuel Systems

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Biomass – Materials vs. Fuels

Biomass Materials that meet the definition for inclusion in CSHP biomass fuels include the following Biomass materials listed as “Renewable Fuels” in the CSHP air permit BACT analysis:

“Renewable fuels” include the following: industrial process grains, spent corn grains and plant based materials, including, but not limited to: wood residue and wood products, such as trees, tree stumps, tree limbs, bark, forest slash, urban wood wastes, lumber, sawdust, sander dust, chips, scraps, slabs, millings, shavings and wood pellets (including pellets bound with polyethylene); waste paper, pressure sensitive paper, corrugated waste paper, poly-laminated films and paper pellets; dried bio-solids, pulp residues, paper mill sludge, organic sludge; non-recyclable cardboard and paper ;animal litter; vegetative agricultural and silvicultural materials, such as logging residues, sugar cane residues, nut and grain hulls and chaff, oat hulls, bagasse, orchard prunings, corn stalks, corn products, alfalfa, coffee bean hulls and grounds, grasses, seeds and seed residues; food processing residues. “Plant based materials” for the purpose of defining renewable resource fuels shall be defined as plant or plant based products that may have been painted, pigment−stained, but NOT pressure treated with compounds such as chromated copper arsenate or pentachlorophenol. Plywood, particle board, oriented strand board, and other types of plant based products bound by glues and resins are included in the definition of plant based materials." Also, renewable fuels shall also include utility poles, railroad ties and construction and demolition waste to the extent that such waste is from a renewable resource.

CSHP Biomass Fuel Specifications

Summary Overview will be refined in RFP and final contracts				
Fuel Type	Chipped	Chipped	Pellet	Pellet
Heat Content (Btu/lb)	5,000	6,500	7,500	8,500
Moisture (%)	40% - 20%		15% - <5%	
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Sulfur ** (%)	< 0.08 to 0.11 (%)		< 0.13 to 0.14 (%)	
Nitrogen** (%)	< 0.15 to 0.19 (%)		< 0.22 to 0.25 (%)	
Chloride** (%) (ppm)	< 0.013 – 0.017 (%) < 130 - 170 (ppm)		< 0.019 - 0.022 (%) < 190 - 220 (ppm)	
Mercury** (ppm)	< 0.027 – 0.035 (ppm)		< 0.040 – 0.045 (ppm)	